Botanical Gazette.

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EDITORIAL.—A new school of botanists is rapidly gaining ground in this country and we are glad to see it. While the country was new and its flora but little known it was very natural for systematic botany to be in the ascendency. It is a very attractive thing to most men to discover new species, but when the chance for such discovery becomes much lessened there is a turning to the inexhaustible field of physiological botany. Systematists are necessary, but a great number of them is not an essential thing and it is even better to have but a few entitled to rank as authorities in systematic work. But in studying the life histories of plants or their anatomical structure we can not have too many careful observers. This, at the present day, seems to be the most promising field and one botanist after another is coming to appreciate it. As microscopes are becoming cheaper and hence more common the workers in the histology of plants are becoming more numerous and it is to such that the GAZETTE would now address itself. It will be noticed that the notes published heretofore would largely come under the head of systematic botany, and it is our intention to continue to give large space to this subject, but we would like to take a stand in this new school and call for notes from its workers. Dr. Rothrock's paper on "Staining of Vegetable Tissues" was a start in the right direction and the eagerness with which such papers are now read is shown by the fact that that issue of the GAZETTE was entirely exhausted in filling orders. We expect to receive many notes pertaining to this branch of our science and if botanists who are interested in it will but come forward the GAZETTE will willingly open its pages to them. Let not only the results of study with the microscope be noted, but observations on the habits of plants, such as their fertilization, movements, absorption and evaporation of moisture, and the many other subjects which are now attracting so much attention. Let there not only be a record of such observations but expressions of opinion as to the best method of teaching how pupils can be made observers, and how far this can be profitably carried. Such topics would open up a new and large field to the GAZETTE and one that would be of interest to all botanists. That short notes upon the teaching of botany would be read with interest goes with the saying, when it is understood that nearly every other man upon our subscription list is a Professor of some kind or other, and that there is no college in the United States, where botany has any sort of prominence, where the GAZETTE is not taken.

VIOLA TRICOLOR, L. VAR. ARVENSIS, DC.—The plant of the United States, so named by Torrey and Gray, is *V. tenella* of Muhl-

enberg (Cat. 1813) and *V. bicolor* of Pursh (Fl. 1814), who evidently regarded it as native and for that reason, perhaps, a distinct species. Even if further comparison with European specimens should prove the determination of Torrey and Gray correct, its claims to a place in our indigenous flora seem to me very strong. In Pennsylvania it is widely diffused, but rare, yet abundant wherever found. It occurs in grassy meadows and on rocky slopes, remote from dwellings and never in cultivated grounds. Its entire behavior is that of a native, and hence unlike that of *V. tricolor* of the gardens, which, though it comes up from self-sown seeds, soon disappears, when not reinforced by fresh plantings, and shows no disposition to spread beyond culture. Mr. Reverchon. in the last number of the GAZETTE, reports it from Dallas county, Texas, and says: "I am satisfied it is native. I have met it in large patches in remote woods and prairies, sometimes *very far* from settlements" To this I may add the fact that it has also been collected in Colorado by Mr. Wm. A. Henry, who thus wrote me Aug. 29, 1876–"I send you more of the violet. It grows on a warm, dry slope at the mouth of Boulder Canon, in a rather inaccessible place. I have seen a few stalks further up the canon. It blooms very early, along with *Leucocrinum montanum*, so that it has probably escaped the notice of other collectors. I gathered it three years before in the same place. It *could* have been introduced, but I greatly doubt that seeds of recent introduction could have reached the spot where I found these plants."

I may here mention another addition to the flora of Colorado. Aubrey H. Smith, Esq., has kindly given me specimens of *Goodyera repens*, R. Br., collected by him on Pike's Peak, Aug. 1878.—THOS. C. PORTER.

LEPIDIUM CAMPESTRE, LINN.—Last September as I was just coming out of the hay fever, a farmer brought me a package of what he said was now becoming a troublesome weed. I instinctively smelled of the plant and brought back some decided symptoms of my malady. The weed proved to be *L. campestre*. As this has hitherto been a rare plant, it is of interest to know that with us it is no longer so. But this crucifer has struggled hard to attain its acclimatization. An adventurer from Europe, it came, as I believe, from Great Britain, where it was accustomed to a mild and humid climate, hence, though a great seed-bearer, ere it could become prolific of individuals it had to struggle through several generations of years in a climate involving extremes so opposite to the conditions of its native land.—S. LOCKWOOD, *Freehold, N. Jersey*.

ZOSTERA MARINA, L.—A. Engler, in a recent number of the *Botanische Zeitung*, has published some interesting observations concerning the "Eel grass," so common in the bays of our own coast. His observations relate chiefly to fertilization and growth. The following is an abstract of his paper from a late number of *Nature*.

At first the thread-like stigma lies on the neighboring anther lobes,

mostly those of the two different anthers; next the style elevates itself, and so the stigma comes out of the narrow slit in the sheath, and receives pollen from some of the older spadices.

After fertilization the thread-like stigmas disappear and at the same moment will be found clusters of as yet unopened anthers around the stigmaless gynœcia, these now having fertilized ovules. This was probably the stage observed by Hofmeister when he described the fertilization as taking place inside the unopened inflorescence. Certainly the anther lobes are not at this stage always emptied of their contents, and certainly when the emptying takes place the gynœcia are often beyond the power of being fertilized.

The condition of the buds also engaged Engler's attention, because the sympodial bud system appeared similar to many Araceæ. The main shoot develops sterile buds from the axil of the nodal scale and then after developing 4 to 6 internodes in the mud grows upward, giving rise to leaves frequently a metre long but never in the same year is inflorescence observed. In the axils of the lower leaves fertile buds are developed which lie alternately to right and left of the main axis. These grow for a great while along with the main axis, the axis of growth thus presenting a flattened cone-shaped form with two furrows superimposed on a cylindrical axis. —C. R. B.

ASPLENIUM BRADLEYI.—During the fall of 1876 while collecting ferns on White River, in northwestern Arkansas, a few specimens of *Asplenium Bradleyi* were found. Since then, by searching closely several localities have been discovered, which have yielded some fine specimens. The species seems to grow upon sandstone, exclusively, as it has not been found on any other formation, and to require situations more or less shaded.

As the plant had never before been found west of the Mississippi River, the discovery is important, because it shows a greater geographical range than the species was supposed to have. It occurs in Kentucky and East Tennessee, and probably will be found across the northern part of this state. The species is not confined to the streams, but has been found upon isolated ledges several miles inland.

Notholæna dealbata, Kunze, grows in northwestern Arkansas abundantly, on limestone ledges which are isolated and have a southern exposure. This species, so far as I know, has never been reported from this state, nor farther south than Kansas.— F. L. HARVEY, *Ark. Ind. Univ., Fayetteville, Ark.*

REPLY TO MR. MEEHAN'S CRITICISMS.—*Aquilegia chrysantha.* In Mr. Meehan's observations on the Wheeler Report "it does not strike those acquainted with the" book and its contents "as being particularly careful records of the facts." For Rothrock says that *A. chrysantha* is "hard to distinguish from *A. cærulea* by any mere description, as they exhibit transition at all points" (Wheeler Rep., p 59, lines 1 and 2). This is not only a similar observation, but also a stronger

statement than mine. Mr. M. has erred again in quoting Rothrock as saying that the flowers are "*always yellow*," "italicizing the words." Mr. R. does not italicize both words and does not say the flowers are always yellow in any but *southern* specimens.

It does not follow because Mr. M. camped at Colorado Springs once that all the species inhabiting its vicinity were found by him. It is as likely that he overlooked *A. chrysantha* as it is certain that he failed to find *Stipa pennata* var. *Americana*, *Anemone cylindrica*, *Psoralea hypogœa* (in the streets), *Asclepias Hallii*, *Eritrichium leiocarpum*, *Pedicularis procera* and many others that I found there, blooming at the same time as *A. chrysantha*. I will say that I have made Colorado Springs my home the greater part of two seasons, doing little else than collecting (securing 1100 species), and would be more apt to know its flora than a transient visitor or even one who camped there once. Besides, Mr. Brandegee found the plant in the Grand Canon of the Arkansas, not 30 miles away in an air line (*Flora Col. p. 4*). My notes were drawn from specimens in my herbarium collected by me at different times and places.

(1) Some specimens have the sepals narrower than petals. (2) Others, broader; sepals 1 inch long, petals over ¾ inch; leaflets 12 to 15 lines wide; spur very slender, 2 inches; sepals broad lanceolate; flowers yellow; plant 30 inches high. (3) Others like (2) except sepals lanceolate or oblong-lanceolate narrower than petals. (4) Like (2) except leaflets 6 lines wide (plant as tall). (5) Like (2) except sepals and petals almost equal; sepals and spurs b ue; plant 24 inches high. (6) Others like (2) except leaflets 2½ inches wide; flowers size of (2) or one-fourth smaller.

Two years ago specimens of this plant were taken up and set out at Colorado Springs. The flowers were yellow when taken up but have been blue since. I have seen the plant in bloom.

Malvastrum coccineum is common on the plains, often in large patches. There is no other common plant (on the p ains) known to be poisonous (except the "Loco" which does not act that way). That 1,200 sheep died in 4 hours after being turned upon a large patch of *M. coccineum* the owner of the sheep knows too well. Botanists can afford to wait a chemical analysis of the plant, but stockmen cannot.

Neillia Torreyi. The "thick pubescence" does not "follow all the forms found in Colorado." I have specimens with glabrous pedicels and calyx. Mr. Meehan's distinction of acute, apiculate sepals in *N. opulifolia*, and obtuse sepals in *N. Torreyi* holds good in all my specimens. The pubescent pods of *N. Torreyi* and glabrous pods of *N. opulifolia* do not seem to be constant, at least I have a number of specimens with very slender pedicels, 2 inches long, pedicels and calyx either glabrous, slightly pubescent or woolly; leaves 3 inches by 2 inches, slightly three lobed, and doubly crenate (not incised); flowers 35 to 40; pods as densely pubescent as Utah specimens of *N. Torreyi*.

Smilax herbacea, L. var *inodora* I found August 8, 1878, in Platte

Canor, but having only the fruit I delayed naming it till I secured the flowers. – MARCUS E. JONES.

NOTE. – Since writing the note on *Malvastrum coccineum*, further correspondence leads me to believe that the large number of sheep lost by Mr. Ruble was caused largely, if not wholly, by poisonous water oozing out of an embankment in the midst of a large patch of *Malvastrum*. I am glad to be able to add this item of evidence in favor of the plant. There are, however, a number of other complaints about this plant yet to be settled. – M. E. J.

THE FLORA OF ST. CROIX AND THE VIRGIN ISLANDS, by Baron Eggers. – This is No. 13 of the Bulletin of the U. S. National Museum and is quite a thick pamphlet, containing 133 pages. Some 21 pages are devoted to a general description of the position, geology and climate of the islands, with remarks upon the characteristic plants. The vegetation is divided into four groups, called the "littoral," the "shrubby," the "sylvan," and the "region of cultivation." The author comes to the conclusion "that at a former period all the West India islands have been connected mutually, and perhaps with the American continent also, during which time the plants in common to all the islands, as well as to the West Indies and the continent, have expanded themselves over their present geographical areas, at least as far as they are not possessed of particular faculties for emigration over the sea."

Then follows a catalogue comprising 1,013 species of phænogamous and vascular crytogamous plants, of which 881 are indigenous and 132 naturalized. The proportion between Mono- and Dicotyledonous plants indigenous and naturalized is 1 to 5.8; in the indigenous ones alone 1 to 4.9, thus showing the plurality of the recently introduced plants to have been Dicotyledonous. Five new species are described one of which is a *Rhus*. One looks in vain for the familar heading *Compositæ* and hardly recognizes it under the form of *Synantherea*. It seems strange also to see all the grasses and sedges put before the *Liliaceæ* and the other kindred families, making the highly specialized Orchids the last of Phænogams. The entire absence of all Ranunculaceous plants is a noticeable feature to workers in our more northern flora.

The report is an interesting one in more ways than can be mentioned in a brief notice and is well worth a careful study.

MOTHS ENTRAPPED BY AN ASCLEPIAD PLANT (PHYSIANTHUS) AND KILLED BY HONEY BEES.—Towards the last of September, Mr. John Mooney, of Providence, an observing man, brought us a stalk of *Physianthus albens*, an Asclepiad plant originating in Buenos Ayres, with the bodies of several moths (*Plusia precationis*) hanging dead by their proboscides or maxillæ. It was found that the moths had, in endeavoring to reach the pollen pocket, been caught as if in a vise by one of the opposing edges of the five sets of hard horny contrivances covering the pollinia. A few days after, Mr. Everett A. Thompson,

of Springfield, Mass., wrote us, that he had a plant of the same species which had caught a number of moths of several species, and that in some cases only the heads and tongues of the moths were left, and he attributed this dismemberment to birds, but wrote in the same letter that his father had seen bees sting the moths while alive and struggling. He sent me one of the moths, which proved to be a *Plusia precationis*, the same species as we had observed in Providence, and a honey bee (*Apis mellifica*) which had been seen by his father to attack the moths, and which had a pollen mass of the same plant attached to one of its fore legs. On writing Mr. Thompson that his father's observations were quite new, the hive bee not being known to be carnivorous, beyond its well-known habit of stinging and killing the males of its own species and the bee moths invading its cells, his father, Rev. L. Thompson, of North Woburn, Mass., a careful observer, kindly prepared the following statement:

"I cannot undertake to give an account of my observations of the plant, moths and bees, concerning which inquiry is made, from the standpoint of a scientist, which I do not claim to be, but after pretty close watching, continued for many days, I feel quite confident of the general correctness of the following statement:

"Early in September, of the present year, as I made one of my daily visits to the plant, to me unknown before, the *Physianthus albens*, or Arauja, I noticed among the many moths that had been caught in the flowers, a considerable number of tongues still in the traps, while all, or nearly all, else belonging to the recent captives had disappeared. While I stood gazing, my attention was arrested by two or three bees buzzing immediately around as many entrapped moths that were alive and struggling to get away. Every moment or two, the bee suddenly and furiously darted upon the prisoner and seemed to sting it despite its desperate efforts to escape, The onset was generally instantaneous, but was repeated again and again, and, after the moth became still and apparently lifeless, the bee settled upon it, and, if my eyes did not greatly deceive me, began to devour it. I had previously noticed the tongues but supposed the bodies of the moths had been eaten by birds, though I had not actually seen it done. I cannot therefore positively assert what seemed to me the fact at the time, though I had no other thought, and the fact that so many of the moths had actually disappeared, leaving only their tongues, and, in some cases, other fragments of their bodies, in the shape of legs clinging to bits of casing or skin, satisfied me that the bees had really feasted on animal food as well as upon the nectar of surrounding flowers.

"I did not suppose it to be the honey bee at the time, but a kind of wasp, such as or similar to that whose nest I had sometimes found in sodded banks or terraces and looked upon as an architectural wonder. Yet I did not examine it, and can only say that I saw many, or supposed I did, upon a bed of Nasturtiums and other flowers, a few feet distant from the Physianthus.

"I think I have found as many as three or four different kinds of

moths upon the plant, besides numerous small black flies which, unlike the moth, go down *bodily* into the flower.—L. THOMPSON."

"*North Woburn, Oct. 29, 1879.*"

Upon writing Dr. Hermann Muller in reference to these facts, he replied as follows:

"Lippstadt, Nov. 10, 1879.—*Physianthus albens* has been observed by Delpino as being visited by humble bees and fertilized by their proboscis. It is a new and very interesting fact that *Plusia precationis* is caught by the flowers of this plant and has been found dead suspended by its proboscis. About carnivorous habits of bees, my brother Fritz, in south Brazil, has observed that honey bees (but I do not remember for the moment whether Apis or stingless Brazilian honey bees) licked eagerly the juice dropping from pieces of flesh which had been suspended in order to be dried in the open air. Nothing else as far as I know has ever been published on the carnivorous habits of bees; I hope, therefore, you will soon publish your very interesting observations."

We have also received the following letter from Mr. Darwin, dated Down, Beckenham, Kent, Nov. 23d. "I never heard of bees being in any way carnivorous, and the fact is to me incredible. Is it possible that the bees opened the bodies of the Plusia to suck the nectar contained in their stomachs? Such a degree of reason would require repeated confirmation and would be very wonderful. I hope that you or some one will attend to this subject."

We have also received the following note from Prof. Gray in reference to the subject: "It has long been familiar, and must several times have been recorded, that moths or butterflies and other insects are caught by getting their tongue, proboscis or legs into the chink between adjacent wings of the anthers in *Physianthus* or *Arauja albens*, and *Asclepias*, etc. The anther-wings are very rigid, the groove between them narrows gradually upwards, so that when a leg or proboscis is engaged, an upward pull only fixes it more securely, and the unhappy insects seem rarely to pull backward or downward, which is the only way to get disengaged. As to the rest of your account I know nothing; and should say that the observations need, if not 'repeated confirmation,' at least some confirmation by an etomological observer."

It appears from the fact that the single worker bee received had a pollen-mass attached to one of its fore legs, that it visited the plant originally for the sake of its nectar. For what purpose did it attack, kill the moths and, as it is claimed, "devour" them? We publish the observations of Mr. Thompson and the comments upon them, with the hope that the subject will receive attention next summer.

Since this note has been put in type, Prof. A. J. Cook, of the Agricultural College of Michigan, well known as an apiarian of experience, informs us that *within the hive*, honey bee workers in killing the drones tear them in pieces with their mandibles rather than sting them, and that he has seen them thus kill a humble bee that had entered the hive: it thus appears, what we judge will be quite new to

entomologists, that the honey bee uses its mandibles, at least on some occasions, as weapons of attack, quite as much as the sting; this would also corroborate the exactness of Mr. Thompson's observations. —A. S. PACKARD, JR., *in Am. Naturalist.*

BURSTING OF THE FRUIT OF EUPHORBIA COROLLATA.—Mr. E. E. White, of Lincoln, Iowa, has noticed the bursting of the pods of *Euphorbia corollata*, with a report loud enough to be heard across an ordinary room. An entire plant had been brought into the house with the view of saving the seed and the reports soon took place. This note is given not so much with the idea that this bursting is peculiar to *Euphorbia*, but that it may call out similar observations and thus group them together in a tangible shape.—PROF. WM. C. WHITE.

CHARACÆ. – For the benefit of several subscribers who have expressed a desire to know something of the structure and position of *characæ*, we take from B. D. Halsted's paper upon the "Classification and Description of the American Species of Characeæ" the following description:

The members of this distinct group of Cryptogams are all filamentous, submerged, aquatic plants, to the naked eye either green or ashy gray in color, depending upon the presence or absence of a calcareous incrustation. The plants are attached by a long, colorless, root-like structure to the muddy bottom of the pond or stream in which they grow, and often form dense masses varying according to the species from a few inches or two to three feet in height. They are remarkable for their large thin-walled cells and the cyclosis of their contents.

In number there is something over a hundred species.

Development:—At the upper end of the spore there is first produced by division a thin-walled, hemispherical shaped cell. This cell soon divides into two by a cell-wall parallel to the longer axis of the spore. Both of these new cells increase in size and push themselves out between the separating ends of the fine enveloping spirals, one turning downward to become the primary rhizoid, the other upward to form the proembryo. The proembryo, the upper portion of which is green, consists of but a few alternating nodal and internodal cells. When the Chara plant develops, one of the disc-shaped nodal cells divides up first into two, and afterwards, by successive divisions, into a number of cells, the largest one of which becomes the initial cell, or *punctum vegetationis* of the future plant. From this cell by further growth and repeated cell divisions the Chara plant is developed.

Antheridia (*globules*):—These, the male organs, are situated on the leaves and are often of an orange color, and from .50 to .75 mm. in diameter. The wall consists of eight cells called shields, closely joined by their serrate edges. The four basal ones are somewhat four sided; the upper four triangular. From the center of each shield-cell there projects into the interior of the antheridium an oblong cell called the manubrium. Each manubrium is surmounted by

a smaller cell known as a capitulum. The capitula end in turn in six secondary capitula from each of which grow four long flagelliform threads which are composed of small disc-shaped cells. The antherozoids are borne singly in the cells. When free from the cell the antherozoid is a spirally twisted, naked, protoplasmic body, many times longer than broad, and is capable of a very rapid motion by means of two cilia which are placed near one end.

Sporangia (nucules):—These are the female organs and when mature are usually of an ovoid shape, and .30 to 1.10 mm. in length. The sporangium consists of a large central cell, the spore and five tubes which are coiled closely around it. The sporangium is a transformed leaflet.

Non-sexual organs of reproduction:—Bulblets are found in a number of species; they occur most frequently at the lower nodes of the plant near the surface of the ground, where few or no leaves are developed and the internodes are colorless.

A second method of non-sexual reproduction is found in *Chara fragilis*, which is called by Pringsheim "Branches with naked base."

Classification:—It is difficult to place the Characeæ very close to any other group of Cryptogams. Their method of development, sexual organs, and anatomical structure separate them from the Vascular Cryptogams on the one side, and the Thallophytes on the other; and bring them nearer to the Muscineæ than to any other general group. Of the Muscineæ they bear the most resemblance to mosses. Differing as they do widely, even from the mosses, in being less complex in structure and in the development of the fruit, it seems fitting that the Characeæ be placed in a group by themselves and arranged with the others in the following order, proceeding from the highest to the lowest: *Vascular Cryptogams*, *Muscineæ*, *Characeæ*, and *Thallophytes*.

SAPORTA'S WORLD OF PLANTS.—In the Popular Science Monthly for February is a review of Count de Saporta's work translated from *Revue Scientifique* by Miss E. A. Youmans. The general bearing of the work is well shown by the reviewer's preface. "Men of science, whose patient researches have accumulated the proofs of the theory of evolution, have perhaps found more facts in support of this great philosophical doctrine in the vegetable than in the animal world. When we say the vegetable world, we of course mean chiefly fossil vegetables. It is only by the study of extinct forms, and their comparison with the living flora, that the affinities between actual types and distant ancestors have been discovered, and their mode of evolution revealed. Vegetable paleontology, it is true, is yet in its infancy, and has many great gaps; still, the rapidity with which it is being developed, and the prodigious number of facts that have been already collected, give good ground for the hope that the day is not far distant when we shall have surely determined the ancestral lines of most of our plants. To this the efforts of paleontologists are tending, and their activity is beyond all praise. During the last twenty years their discoveries have furnished the matter for large volumes and for many memoirs, pub-

lished in the reports of academies of science, in the bulletins of geological societies, etc. But the profound lessons derived from these discoveries have hitherto been almost the exclusive possession of scientific men. People of general intelligence, who are interested in all progress, have known little of the results obtained. This injustice could be no longer tolerated. A complete treatise was required, written in a style that all could comprehend, and summing up the progress thus far accomplished; and M. de Saporta, one of the most eminent authorities in vegetable paleontology, has just published such a work."

"The study of fossil flora not only enables us to follow the evolution of plants from their remotest known ancestors to their present actual descendants, but it throws much light upon the past mysteries of the earth, and especially upon the climatic conditions which controlled its surface while the slow revolutions of organic life were going on." We will quote here and there from the review, not having space for the entire article, although one of great interest to all interested in the history of plants. "There exists between a flora and the climate in which it lives a relation so close that, knowing the one, we can represent the other. Palms do not grow in Greenland nor fir-trees on the plains of equatorial Africa. Each climate has its flora, and each flora its climate.

Paleontology has established the permanence and universality of this law; but it has at the same time established a singular fact which remains inexplicable. It is this: the different climates of the earth have not always been what they are now, either as to temperature or distribution. We speak only of those epochs which have succeeded each other since the time of the most ancient known plants. If we transport ourselves in thought to a time toward the end of the Tertiary period, and then, leaving behind us the Quaternary epoch, follow the course of ages, we find, as an increasing enlargement of the tropical zone, that which is equivalent to an increase of temperature for the whole earth. More extended in the Pliocene epoch than in our day, this zone was still greater in the Miocene epoch, and yet greater in the Eocene, and so on till we reach a time when it embraced the whole surface of the earth, bestowing everywhere an equal temperature, feebly oscillating between certain limits. This climatic equality, which, according to Saporta, reaches at least as far back as the time of the coal, would probably cease at the epoch of the lower chalk. Such is the fact established by examination of the flora of different ages."

"Saporta divides the world of fossil vegetables into four great periods: 1. The Primordial or *eophytic*, corresponding to the Laurentian, Cambrian, and Silurian; 2. The Carboniferous or *paleophytic*, comprehending the Devonian, Carboniferous, and Permian; 3. The secondary period or *mesophytic*, commencing with the Trias and reaching to the end of the chloritic chalk; 4. Finally, the Tertiary or *neophytic*, embracing all the formation from the chalk of Rouen up to and including the Pliocene."

"The flora of the eophytic period is unknown. The *debris* which represents it has in general a character so vague that there is yet no agreement upon its true nature. The graphite found in the Lauren-

tian indicates, however, that from this epoch vegetables existed in great abundance."

"Many of these primordial plants are undeniably linked with more modern types, of which they bear the generic form, and prove that this primordial flora is not really separated from that which followed it. We can even affirm that certain Silurian algæ have had a duration so prodigious and a tenacity of character so pronounced that their last direct descendants were living in the European seas in the middle of Tertiary time."

"With the Devonian things changed. The bad state of preservation of fossil vegetables belonging to this formation has not permitted us to study them perfectly; but, from the aspect of those which we possess, we conclude that at this epoch the vegetable kingdom was already vigorous and varied, and that nature while in its infancy put forth the carboniferous flora, the almost inconceivable exuberance of which has never since been equalled." "The plants of this flora belong exclusively to the two classes of vascular cryptogams and gymnospermous phanerogams." "The Permian flora, which succeeded the Carboniferous, is only a pale reflection of it." "Saporta says of the Trias, which commences the Secondary or mesophytic period, that "it appears to correspond to one of those periods of revival where the failing types finally disappear, while those which displace them are successfully introduced. The first leave chasms because they are reduced to a decreasing number of individuals; the last are yet obscure and rare. Both old and young are equally feeble, and, when these two extremes meet, the apparel of nature seems poor and monotonous." At the beginning of the Jurassic period a transformation is already manifest, and we soon find ourselves in the presence of a new flora, where the carboniferous types have disappeared, but where, except some rare monocotyledons, the angiosperms are still wanting. From Spitzbergen to Hindostan, from Europe to Siberia, everywhere the same vegetable forms, so that the character of the Jurassic flora is monotonous, lifeless, and relatively indigent." "We know not under the influence of what conditions organic evolution, and especially the appearance of dicotyledons, has taken place; but we do know that from the commencement of the neophytic period, these plants appear in a multitude of places and multiply with great rapidity." "This revolution," says Saporta, "has been as rapid in its progress as universal in its effects."

NOTES ON FUNGI.—In printing Miss Banning's paper in the January GAZETTE some mistakes were made which should be corrected. In the description of *R. emetica* (p. 7) read "rose-color" instead of "sage-color." *R. alutacea* (p. 7) has "buff-colored" spores instead of "half-colored." In *A. rubescens* (p. 6) from Eastern Maryland the spores measure .0003 x.00032 inch; small plant from Western Maryland .0003 x.00026 inch.

CATALPA SPECIOSA, WARDER.—On page 3 of the January GAZETTE "3½-4 times" should read "3½-4 lines." The date of Dr. Warder's

first publication of this species, in the Western Horticultural Review, is 1853. The dissepiment (p. 3, l. 22,) of *C. bignonioides* is flatter (or more compressed) but not "flat" as is stated.

CORRECTION.—On page 12 in the last GAZETTE, for "coniferous" read "cruciferous."

When in some emergency an editor weakly yields to the temptation of doing some careless "stuffing" he is very apt to repent it at his leisure. Fortunate is he if his patrons are both keen enough and friendly enough promptly to call his attention to the fact and thus prevent a repetition of the offence. The note reprinted from the *Independent* in the last GAZETTE has called forth such an inundation of rebukes and remonstrances as to completely counteract any tendency to "stuff" in the future. We wish to print a part of one of the best of these, from a botanist of high rank, both for our own satisfaction and the benefit of our patrons:

"The *Polypodium vulgare* is certainly not our form of the species, and is very probably not *P. vulgare* at all. But in the story about *Pringlea* the mistakes are very amusing. The statement is:—'One of these (*Pringlea antiscorbutica*) is not only special to the Island, but it is distinct from any known coniferous plant in having powdery pollen and no petals."

All coniferous plants have "powdery pollen and no petals." *Pringlea* is not special to the Island. but occurs on three other groups or islands. It is not *coniferous*, but is *cruciferous*. (This mistake was not the fault of the writer in the *Independent*.—ED.) It has petals sometimes, "1–4, clawed, rosy-tipped, inconspicuous, caducous."

It differs from the crucifers not in having powdery pollen, for all crucifers have powdery pollen, but in that the pollen is produced in greater abundance, and in that the grains are "smaller, and perfectly spherical, instead of ellipsoid with three furrows."

Sir Joseph Hooker thinks the plant is anemophilous, while the rest of the order is said to be entomophilous. *Pringlea* though closely related to *Cochlearia*, has more the habit (and the use) of a cabbage, and as it grows on islands where winged insects are either scarce or wanting, it is not strange that it should be wind-fertilized."

THE BOTANICAL INDEX.—This neat quarterly, published by L. B. Case, Richmond, Ind., still continues to be full of interest, especially to the horticulturist. The press-work and designs are fine, and in the last number a brief summary of botanical progress for the past year, evidently prepared with great labor, is of interest to every botanist.